

MEAP

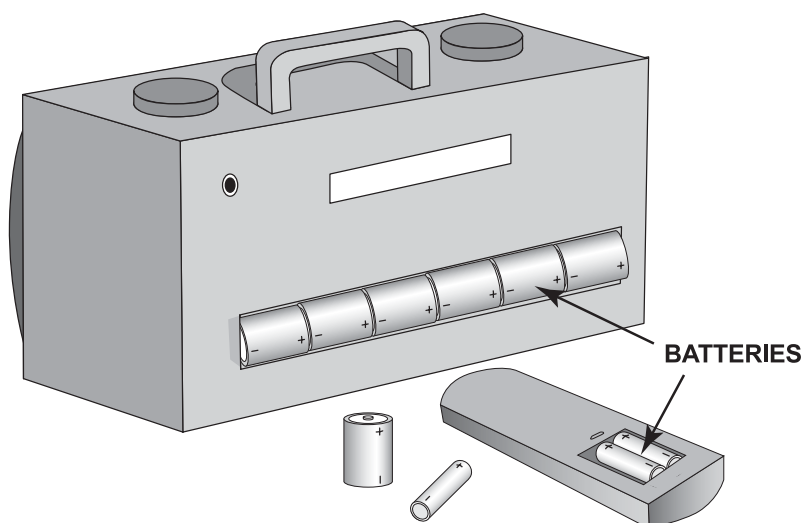
**MICHIGAN
EDUCATIONAL
ASSESSMENT
PROGRAM**

High School Test In Science

***Released Items
Spring 2004***

- 2 The chloride ion typically has a negative charge. Which of the following explains why the chloride ion has a negative charge?
- A It has more neutrons than protons.
 - B It has more protons than neutrons.
 - C It has more electrons than protons.
 - D It has more electrons than neutrons.

Use the following information to answer items 6 through 9.

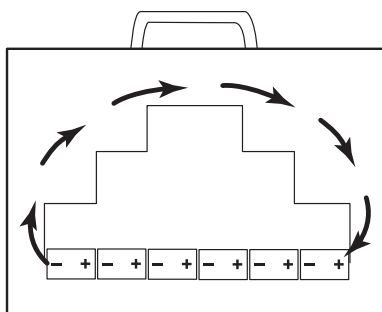


Julia has a new portable stereo with remote control. This stereo requires 6 size D batteries. The remote requires 2 AA batteries. While the stereo runs on DC (direct current) power, it can also be powered with its AC (alternating current) adapter using household current. Julia, however, wants to take it to the park, so she puts in batteries. She notices that the stereo uses batteries in a series arrangement, while the remote uses batteries in a parallel arrangement.

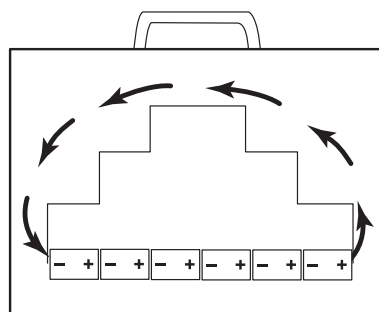
- 6 Soon after Julia starts using her stereo, one of its batteries and also one of the batteries used in the remote are completely drained of power. Which of the following is a good hypothesis as to which device will still work, even with a powerless battery?
- A The stereo will work because its batteries are arranged in series.
 - B The remote will work because it has a parallel battery arrangement.
 - C The remote will work because AA sized batteries have built-in switches.
 - D The stereo will work because D sized batteries carry such a high voltage.

- 7 Which of the following simplified diagrams correctly shows the flow of electrons from the batteries through the stereo's circuitry?

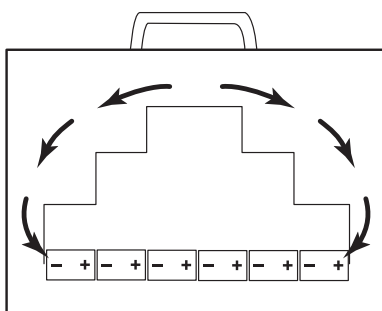
A



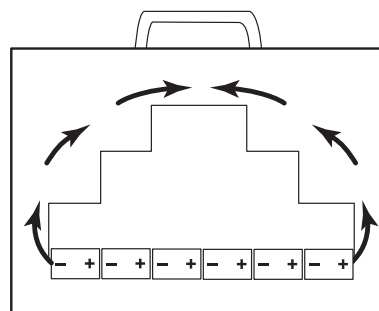
B



C



D



- 8 Julia notices that the wiring connected to the batteries' terminals is not copper. She is confused, because in class they used copper wiring for experiments with electricity. Julia correctly hypothesizes that because the material she sees is conductive like copper, then it is made of elements that

- A are as dense as copper.
- B have the same melting point as copper.
- C have the same atomic weight as copper.
- D are in the same family as copper on the periodic table.

ANSWER THE FOLLOWING CONSTRUCTED-RESPONSE ITEM IN YOUR ANSWER FOLDER.

**9 Constructed-Response
(3 points)**

Julia wants to determine which of her batteries have little or no power remaining. She gathers the following materials: a flashlight bulb, two pieces of copper wire, and some tape.

- Describe a circuit or create a drawing, complete with labels, using only the above materials, that can be used to test which batteries have power remaining.
- Explain how one could test the batteries.

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.

**MEAP Science
HST 2004
Item 9**

ACCEPTABLE RESPONSE

Description of Battery Connection

Connect the one end of each of the wires to a different terminal or end of the battery. (See Diagram)

Description of Bulb Connection

Connect one of the remaining ends of a wire to the base of the bulb and the other remaining wire to the side of the bulbs' metal band. (See Diagram)

Explanation

If the bulb lights, then the circuit is complete and the battery has some remaining power. The brightness of the bulb also determines the strength of the batteries. The student can also state that any battery that does not light up the bulb is the battery that has little or no power.

Other acceptable responses:

- Use a battery tester
- Use a volt meter

SCORE POINTS

3 - Student correctly describes or draws a proper circuit:

- Battery Connection
- Bulb connection
- Acceptable explanation

2 - Student correctly describes or draws two of the acceptable responses:

- Battery Connection
- Bulb connection
- Acceptable explanation

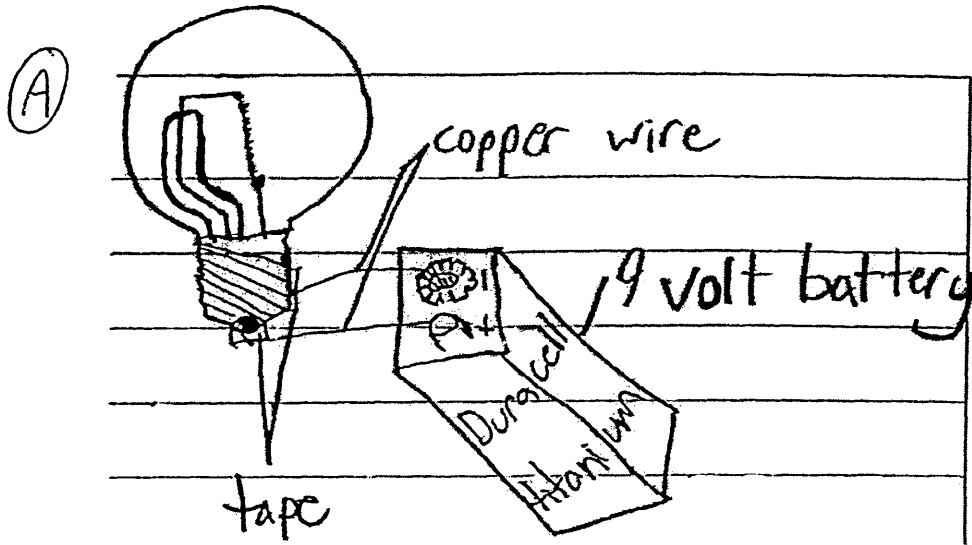
1 - Student correctly describes or draws one of the acceptable responses.

- Battery Connection
- Bulb Connection
- Acceptable explanation

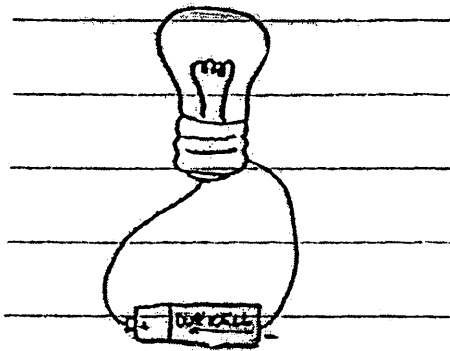
0 - Student fails to understand the task.

2 points

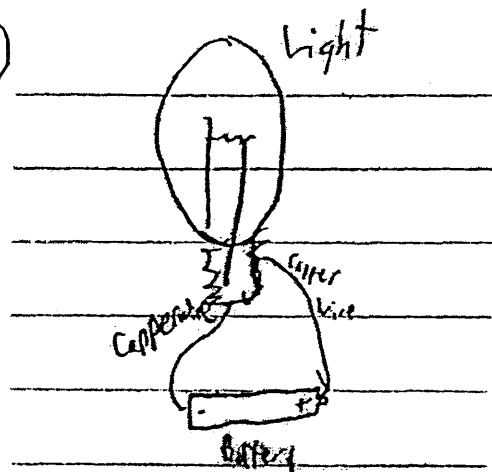
Acceptable battery and bulb connections



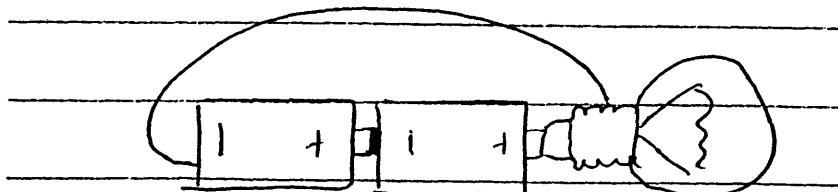
(B)



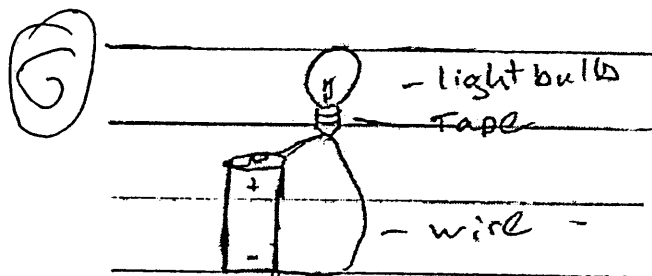
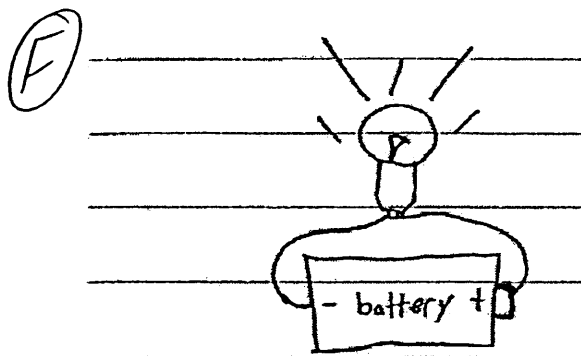
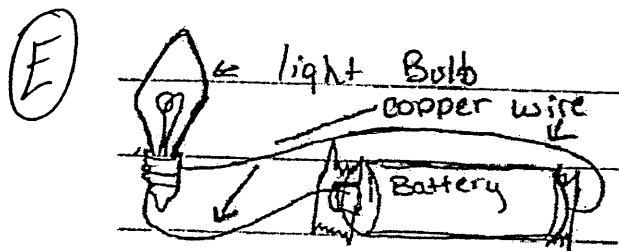
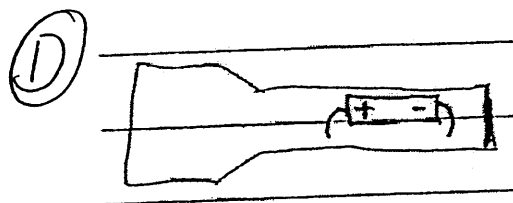
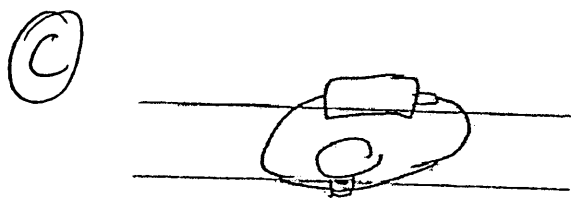
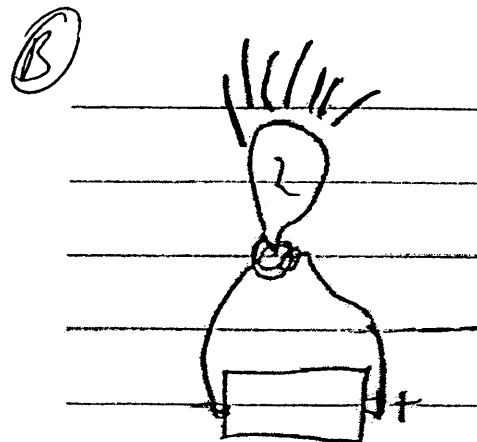
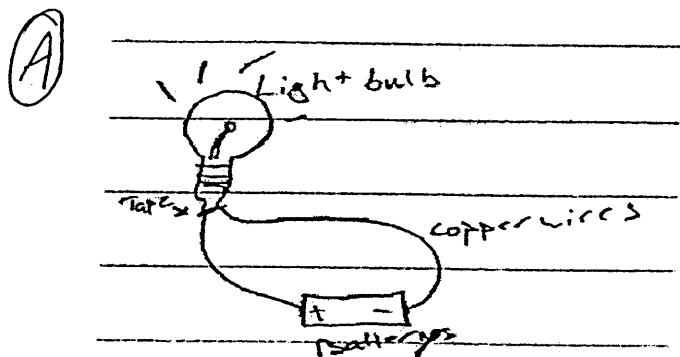
(C)



(D)

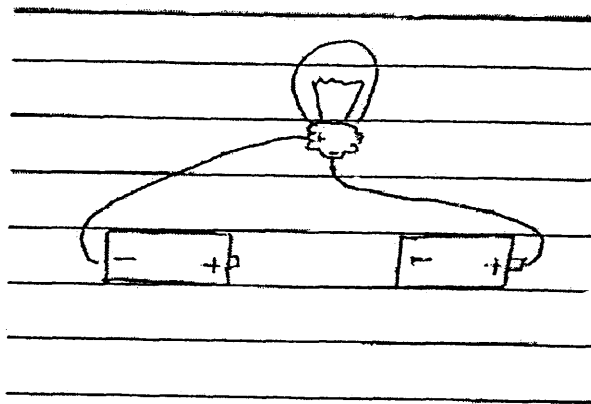


1 point
Acceptable battery connections

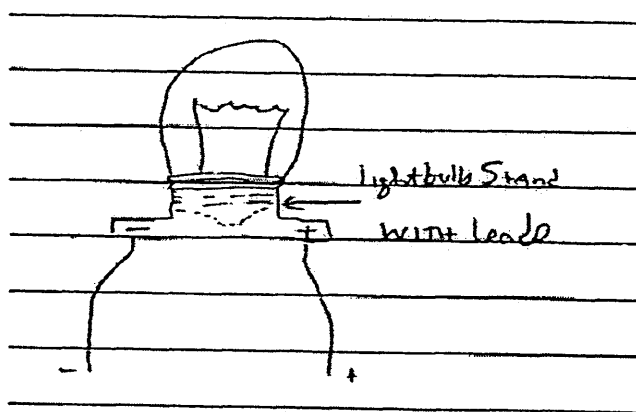


1 point
Acceptable bulb connections

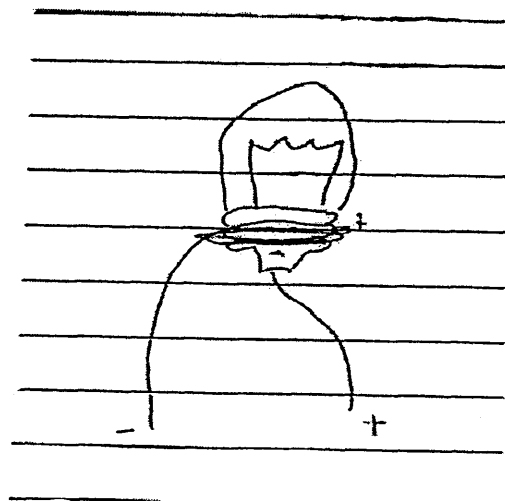
A



B



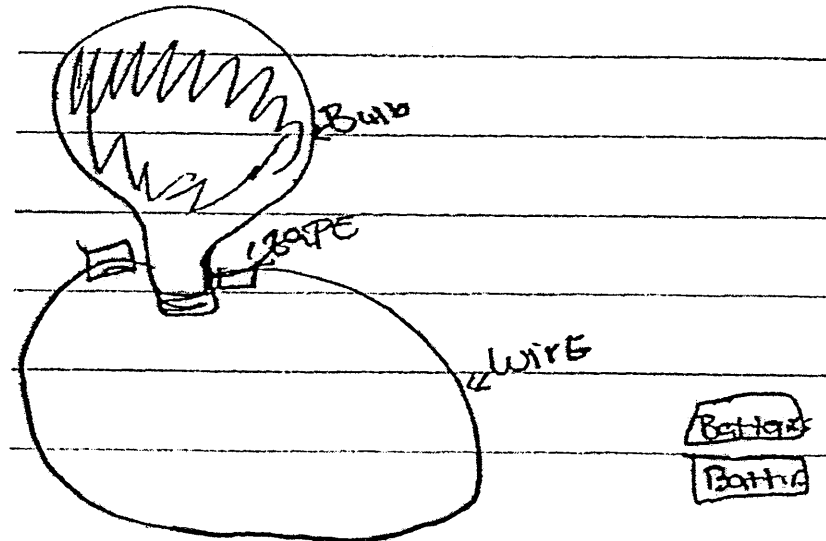
C



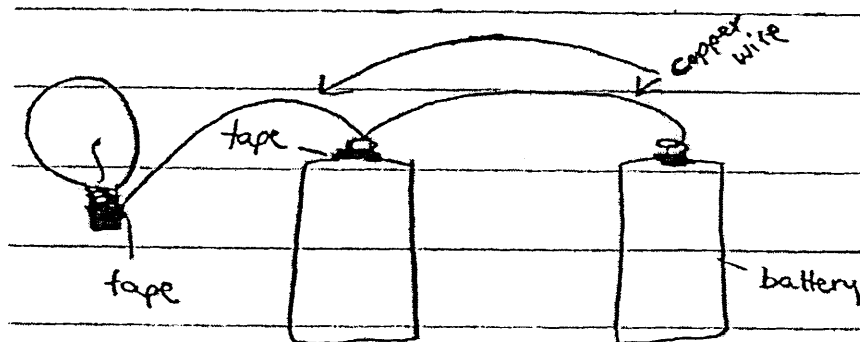
0 points

Unacceptable battery and bulb connections

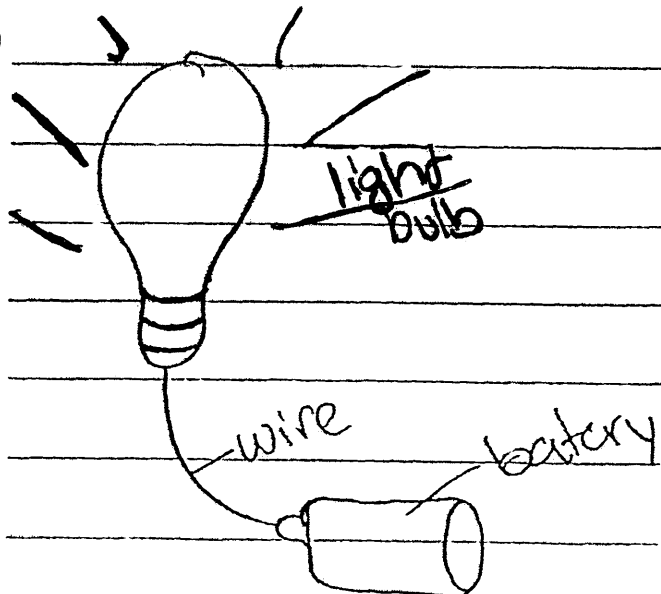
(A)



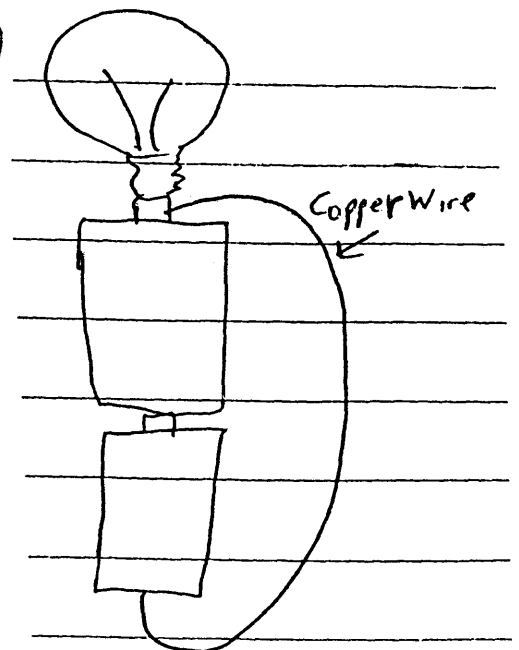
(B)



(C)



(D)

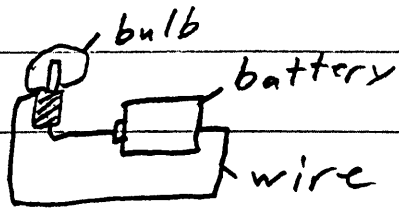


Constructed Response	<p>And if the bulb lights up the battery is good</p>

Score Point: 3

This response shows a correct diagram for both the battery and the light connections needed to form a circuit. It also provides a correct explanation of how to test the batteries (if the bulb lights up the battery is good).

Constructed Response

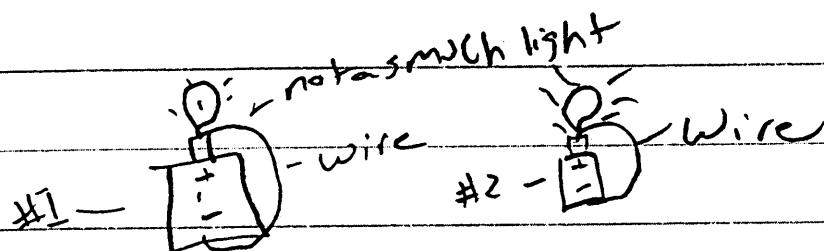


She could connect the batteries to the wire one at a time and watch how the lightbulb reacts.

Score Point: 2

This response is a correct diagram for both the battery and the light connections needed to form a circuit.

Constructed Response

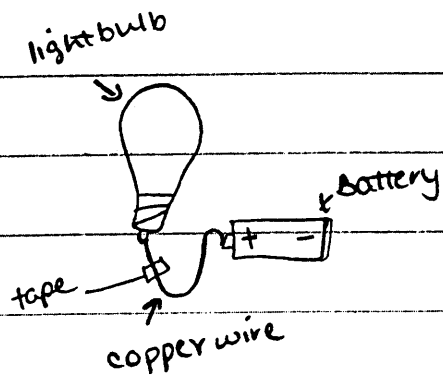


after doing the diagram above
see which bulb is brighter.

Score Point: 1

This response is a correct explanation of how to test the batteries (see which bulb is brighter).

Constructed Response



Julia could test the batteries to see if they still have charge remaining by connecting the copper wire to the positive end of the battery and connecting the other end of wire on the light bulb.

Score Point: 0

This response fails to understand the task.

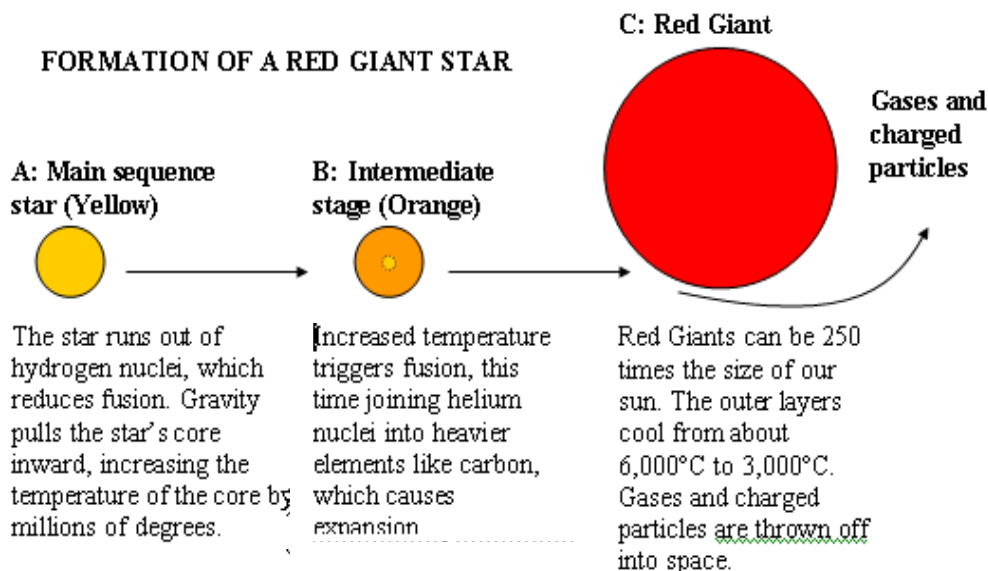
11 Caves formed by water erosion of saturated underground limestone are formed where?

- A** above the water table
- B** below the water table
- C** only in regions exposed to snow melt
- D** never in regions exposed to snow melt

13 The Big Bang Theory states that Earth is

- A** moving away from the center of the universe.
- B** spiraling in towards the center of the universe.
- C** drifting in a random path throughout the universe.
- D** traveling in an orbit around the center of the universe.

Use the following information to answer items 20 through 23.



Using a telescope, you observe a star 50 light-years away that is changing from a main sequence star into a red giant. You are told that only main sequence stars can become red giants, and that our sun is a main sequence star. A star must shine for billions of years before becoming a red giant. The above diagram describes what happens during this change.

- 20** When you look into the telescope, which of the following is true about the image you see?
- A** The image is 50 times dimmer than the star.
 - B** The light took 50 years to reach the telescope.
 - C** The image produces 50 times less light than the star.
 - D** The star is 50 times larger than it appears in the image.

- 21 It is possible to observe this red giant using a radio telescope. What does this directly illustrate about the red giant?
- A It produces sounds in addition to electromagnetic waves.
 - B It produces vibrating electrons in addition to electromagnetic waves.
 - C It produces electromagnetic waves with longer wavelengths than light.
 - D It produces electromagnetic waves with smaller frequencies than light.
- 22 You point your telescope to another main sequence star. What question would you need to answer before claiming that this star will soon turn into a red giant?
- A How old is the star?
 - B How far away is the star?
 - C Does the star have planets?
 - D In what direction is the star?

ANSWER THE FOLLOWING CONSTRUCTED-RESPONSE ITEM IN YOUR ANSWER FOLDER.

- 23 **Constructed-Response**
(3 points)
- After a red giant burns out, a great deal of gas is left in space. A friend claims that a new star can arise from this gas.
- Can this gas alone produce a new star?
 - Explain specifically why or why not.

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.

MEAP GRADE 11
Spring 2004
Item 23

Acceptable Responses

- (1) NEW STAR (Student must include the following point in his or her response.)
- The gases cannot produce a new star.
- (2) PARTICLES/ENERGY (Student must include one of the following points in his or her response.)
- Particles are too large/heavy.
 - There is not enough energy left/too cool in cloud of gas.
 - There are not enough small particles/hydrogen nuclei.
 - Elements are too far apart/gravity is insufficient/insufficient amount of matter..
- (3) FUSION (Student must include the following point in his or her response.)
- To undergo fusion.

NOTE: If a student says “Yes, the gases can form a new star”, then the student must show that they understand **all three** key components to fusion; close/hot/right material and that fusion must take place.

For 3 points

Scoring Guide

- 3 points = All three points are given correctly.
- 2 points = Two points are given correctly.
- 1 point = One point is given correctly.
- 0 points = Student fails to understand the task.

Constructed Response

No, this gas alone cannot produce a new star. It needs the help of Gravity and fusion.

Score Point: 3

This response correctly answers whether gas alone can produce a new star (No), and fully explains why (It needs ... gravity and fusion).

Constructed Response

This gas alone cannot produce a star because for a star to be created you need dust particles and other particles to create a solid star. Gas is used in the process of forming a star but can't form one alone.

Score Point: 2

This response correctly answers whether gas alone can produce a new star (cannot produce a star), and partially explains why (you need dust particles).

Constructed Response

No. A star may emerge from this gas but the gas alone cannot create a star. An outside force is needed to get the dust to begin spinning and compacting into a star. After it has begun spinning and compacting it will form small klumps of matter which then join to create larger and larger bodies of matter until a star is created.

Score Point: 1

This response correctly answers whether gas alone can produce a new star (No).

Constructed Response

The gas alone can produce a new star after a red giant burns out, with the great amount of gases left in space by it. A star, or something, cannot just speratically appear out of no where, its been tested. You need chemicals and gases all to work together to form the compounds that make up something.

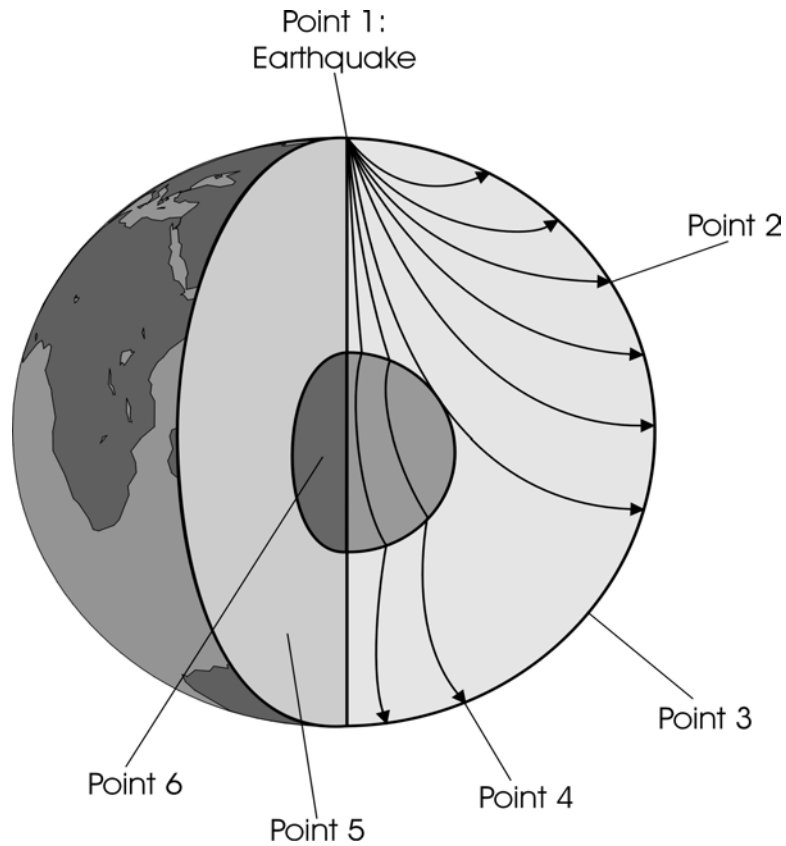
Therefore, I would have to agree with the friend that claims a new star will arise. It may take a very long time, but eventually it will.

Score Point: 0

This response fails to understand the task.

- 32** Before modern fertilizers were introduced, farmers regularly allowed certain amounts of their land to grow wild in order to renew the soil before planting crops again. This increased the output of the farm by doing which of the following?
- A** decreasing the average yield per crop
 - B** decreasing the amount of carbon in the soil
 - C** increasing the amount of usable nutrients in the soil
 - D** increasing competition between crops and wild plants

Use the following diagram to answer items 36 through 39.



36 Where in the diagram can the *highest* pressure be found?

- A Point 1
- B Point 4
- C Point 5
- D Point 6

- 37 In the field of earth science, the arrows in the diagram represent which of the following?
- A gamma waves
 - B seismic waves
 - C ultrasound waves
 - D electromagnetic waves
- 38 Which point in the diagram represents the location with the *highest* temperature?
- A Point 1
 - B Point 3
 - C Point 5
 - D Point 6

ANSWER THE FOLLOWING CONSTRUCTED-RESPONSE ITEM IN YOUR ANSWER FOLDER.

- 39 **Constructed-Response**
(3 points)
- Persons who live at points 3 and 4 all claim that, although they were awake when the earthquake occurred, they did **NOT** feel it.
- Explain why for both points.
 - How could persons living at point 4 have known that there was an earthquake happening at point 1?

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.

**MEAP Science
HST 2004
Item 39**

Acceptable Responses

- POINT 3 (Student must include the following point in his or her response.)
 - People at point 3 would not experience the quake because no seismic waves reached their region/ they live in a shadow zone.
- POINT 4 (Student must include the following point in his or her response.)
 - People at point 4 would not experience the quake because the seismic waves are too small to detect or because they were too far away from the epicenter.
- EXPERIENCED (Student must include one of the following points in his or her response.)
 - Used scientific equipment (seismographs).
 - Observed a geologist detecting seismic waves.
 - Communications (TV, News, Radio, Telephone, Internet, E-mail, etc.)

Scoring Guide

- 3 points = All three points are given correctly.
- 2 points = Two points are given correctly.
- 1 point = One point is given correctly.
- 0 points = Student fails to understand the task.

Constructed Response

A person at point 3 would not have felt the earthquake while they were awake because, due to the pressure in the core, the waves were bent away from point three. A person at point four would probably not have felt the earthquake because it was too weak, even though the waves came to that point. People living at point four could use sensitive equipment to measure geologic activity or could have relied on scientific reports to learn of the earthquake.

Score Point: 3

This response correctly explains why an individual at Point 3 or Point 4 did not feel the earthquake at Point 1 (Point 3: due to pressure in the core, the waves were bent away; Point 4: it was too weak). It also correctly explains how an individual at Point 4 would have known about the earthquake at Point 1 (use sensitive equipment to measure geological activity).

Constructed Response

- For point 3 the people did not feel the earthquake because there were no seismic waves in their area. For point 4 they were so far away from the initial place that the earthquake occurred that they did not feel it.
- The vibration of stationary objects.

Score Point: 2

This response correctly explains why an individual at Point 3 or Point 4 did not feel the earthquake at Point 1 (Point 3: no seismic waves in their area; Point 4: so far away from the initial place).

Constructed Response

- People at point 3 didn't feel it b/c there weren't really any seismic waves hitting the point. They weren't strong enough to be felt or do any damage.

Plus it is far away from the earthquake.

People @ Point 4 didn't feel it b/c by the time the wave reached Point 4, it was really weak, b/c it is

so far away from the earthquake.

- They could tell by the temperature of the ground + different materials from that point.

Score Point: 1

This response correctly explains why an individual at Point 4 did not feel the earthquake at Point 1 (the wave ... was really weak because it is so far away).

Constructed Response

The people at pt. 3 probably could not have felt it because they weren't by the highest point of pressure. People at pt. 4 probably could have not felt it because the waves are not that strong & they too weren't at the highest point of pressure. People at pt. 4 probably could have known there was an earthquake at pt. 1 because they probably could have felt the after shock.

Score Point: 0

This response fails to understand the task.

Use the following information to answer items 40 through 43.

Some scientists estimate that each year 2 million people become infected in hospitals and, of these, about 80,000 die. A group of researchers investigated this phenomenon in a laboratory by placing 22 different kinds of bacteria on five different types of fabric commonly used in hospitals. They wanted to see how long the bacteria would survive on the fabric. The results showed that most bacteria can live on fabric for at least one day, though some can survive three months. The study also found that bacteria lived longer on artificial fabrics like polyester than on natural fabrics like cotton.

- 40 Which of the following is an example of an observation made in this experiment?
- A Infection in hospitals is a serious problem.
 - B Bacteria on fabric can cause hospital infections.
 - C Each year 80,000 people die from hospital infections.
 - D Some bacteria can survive on fabric for three months.
- 41 Which of the following is a verifiable conclusion resulting from this experiment that *might* help hospitals reduce infection rates?
- A Bacterial infections can be very dangerous to patients.
 - B Two million people are infected each year in hospitals.
 - C Hospitals must be free of accidental bacterial infections.
 - D Bacteria live longer on polyester than they do on cotton.
- 42 The organisms observed in the investigation can be classified as which of the following?
- A fungi
 - B protists
 - C animals
 - D monerans

ANSWER THE FOLLOWING CONSTRUCTED-RESPONSE ITEM IN YOUR ANSWER FOLDER.

**43 Constructed-Response
(3 points)**

A student produces the table below after performing a similar investigation using four kinds of bacteria and four types of fabric.

STUDENT'S BACTERIA INVESTIGATION

TRIAL	BACTERIA	FABRIC	LIFESPAN
1	A	PURE COTTON	1 DAY
2	B	COTTON TERRY	14 HRS
3	C	COTTON-POLYESTER	3 DAYS
4	D	PURE POLYESTER	2 WEEKS

- Identify two errors in the design of the student's investigation.
- Explain how one of these errors might make the student's results *less likely* to indicate which fabric hospitals should use.

NOTHING WRITTEN IN THIS TEST BOOKLET WILL BE SCORED.

MEAP GRADE 11
Spring 2004
Item 43

Acceptable Responses

- (1) **ERRORS** (Student must include two of the following points in his or her response.)
- The student used more than one independent variable/experimental group per trial.
 - The student had no controlled variable/group.
 - The student failed to test each bacterium on each fabric, or failed to test each fabric on each bacterium.
 - The student did not perform enough trials.
 - The student did not use enough kinds bacteria.
 - Experimental design – Background variables need to be constant
- (2) **EXPLAIN** (Student must include one of the following points in his or her response.)
- The investigation is less effective because we don't know how long each bacterium will live on each fabric.
 - Purchasing department/physicians and/or nurses won't know which fabric to use/is the safest/carries the least bacteria/carries which bacteria.
 - The student will not know for sure the outcomes of the investigation since there were not enough fabrics/bacteria used.
 - A control group is necessary for comparison with the experimental group.
 - A number of trials are necessary to draw an accurate conclusion.

Scoring Guide

- 3 points = All three points are given correctly.
2 points = Two points are given correctly.
1 point = One point is given correctly.
0 points = Student fails to understand the task.

Constructed Response

The first big mistake I see is that he only tested each bacteria one time, when I would have tested each one at least 3 to 4 times.

Another problem is this person did not test each bacteria on each piece of fabric. Therefore the chart is probably not very accurate. By doing more test would have made the life span more accurate as well.

Score Point: 3

This response correctly identifies two errors (only tested each bacteria one time; did not test each bacteria on each piece of fabric) and gives a correct explanation (by doing more test ... more accurate as well).

Constructed Response

All the bacteria should be one kind and there should be a number of trials done on that one kind of bacteria. There could have been an error in the trial if there's only one.

Score Point: 2

This response correctly identifies one error (there should be a number of trials) and gives a correct explanation (there could have been an error in the trial if there's only one).

Constructed Response

He should put each bacteria on each cloth. Each bacteria should be of each form. His data would not come out the same.

Score Point: 1

This response correctly identifies one error (he should put each bacteria on each cloth).

Constructed Response

Cotton terry, & Pure Polyester
takes to long get something
that is shorter

Score Point: 0

This response fails to understand the task.

- 57 Why does the nitrogen cycle limit the carrying capacity of some ecosystems when Earth's atmosphere is 78% nitrogen?
- A Only ultraviolet light can bond nitrogen with nonpoisonous elements.
 - B Very few organisms can fix nitrogen into biologically useful compounds.
 - C Only animals can use nitrogen in chemical reactions that give them energy.
 - D Compared with solids, gases have such a low density that nitrogen is still scarce.

High School Key

Item		
#	Key	Benchmark
2	C	IV.2.h.1
6	B	I.1.h.2
7	A	IV.1.h.5
8	D	II.1.h.1
9	CR	II.1.h.3
11	B	V.2.h.1
13	A	V.4.h.2
20	B	V.4.h.2
21	C	V.4.h.2
22	A	I.1.h.4
23	CR	II.1.h.1
32	C	III.5.h.6
36	D	V.1.h.2
37	B	IV.4.h.4
38	D	V.2.h.2
39	CR	IV.4.h.4
40	D	I.1.h.2
41	D	I.1.h.2
42	D	III.2.h.1
43	CR	I.1.h.2
57	B	III.5.h.5

Periodic Table of the Elements

IA																VIIIA					
1 H 1.0080																2 He 4.0026					
IIA																IIIA	IVA	VA	VIA	VIIA	
3 Li 6.94	4 Be 9.012															5 B 10.811	6 C 12.0115	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.18
11 Na 22.9898	12 Mg 24.31	IIIB	IVB	VB	VIB	VIIIB	VIII B				IB	IIB	13 Al 26.9815	14 Si 28.086	15 P 30.974	16 S 32.06	17 Cl 35.453	18 Ar 39.948			
19 K 39.102	20 Ca 40.08	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.71	29 Cu 63.546	30 Zn 65.37	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.909	36 Kr 83.80				
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (97.9)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.4	47 Ag 107.868	48 Cd 112.40	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30				
55 Cs 132.91	56 Ba 137.34	* 57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.22	78 Pt 195.09	79 Au 196.97	80 Hg 200.59	81 Tl 204.37	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)				
87 Fr (223)	88 Ra 226.0	♦ 89 Ac 227.0	104 Rf (261)	105 Db (262)	106 Sg (263)																

*Lanthanoid series

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.96	64 Gd 157.25	65 Tb 158.9	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97
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♦Actinoid series

90 Th 232.0	91 Pa 231.0	92 U 238.03	93 Np 237.0	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)
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